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AUTHOR Gallagher, Rosina M.; Balasubramonian, K.
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ABSTRACT

Three major purposes of this investigation were: (1) to identify, evaluate, and adapt a standardized instrument that may be used in the evaluation of Spanish-English bilingual preschool programs; (2) to compare the norms based on the standardization sample with those on a local sample; and (3) to identify an index of general development for the target group in terms of both local and original Minnesota Child Development Inventory (MCDI) norms. The sample included 364 preschoolers of lower middle socioeconomic, Spanish-speaking families in a large metropolitan area in the Midwest. The results of the study indicate that, while the comprehensive nature of the MCDI warrants its use in similar programs, local norms especially suited to the specific population should be developed. The desirability of alternate administration techniques is also evident. (Author)

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Developmental Characteristics in the Bilingual-Bicultural Preschooler as Measured by the Minnesota Child Development Inventory

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by

Rosina M. Gallagher
Department of Government Funded Programs
Board of Education of the City of Chicago

and

K. Balasubramonian
Bilingual Education Service Center
Mount Prospect, Illinois

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Introduction

Early childhood education and bilingual education represent two relatively new educational models which are gradually becoming an integral part of the national school system. Assessment of student growth in each of these areas has been difficult due partly to lack of appropriate evaluation instruments and to the need for modifying available research designs and statistical methodology. Research and evaluation combining both of these areas, therefore, has been doubly problematic. This paper reports an attempt to use a standardized instrument in studying the developmental characteristics of children entering early childhood bilingual education programs.

Purpose of the Study

Three major purposes of this investigation were: first, to identify, evaluate and adapt a standardized instrument that may be used in the evaluation of Spanish-English bilingual preschool programs; second, to compare the norms based on the standardization sample with those on a local sample; and third, to identify an index of general development for the target group in terms of both local and original norms.

The Minnesota Child Development Inventory (MCDI)[1] was selected at the end of a relatively thorough search because it provides an overall index of development as well as measures on specific scales. The authors of the MCDI describe its format and purpose as follows:

> The Minnesota Child Development Inventory provides a means for the developmental evaluation of the preschool-age child that conserves professional time by using an inventory format to obtain the mother's observations of her child. The Inventory consists of 320 statements describing the behaviors of preschool-age children and provides eight scales for measuring the child's development: General Development, Gross Motor, Fine Motor, Expressive Language, Comprehension-Conceptual, Situation Comprehension, Self Help, and Personal-Social.... The Inventory is intended for the preliminary identification of the child whose development is below expectations for his age and sex.[2]

Sample and Method

The first step was to prepare two different Spanish translations. These were reviewed and compared by representatives of each of the major Latin American ethnic groups. A final translation was agreed upon, printed and sent to parents of children entering bilingual preschool programs in the Chicago metropolitan area. Eighty-five percent of the parents who were

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[1] Developed by Harold R. Ireton and Edward J. Thwing and published by the Interpretive Scoring System, a Division of National Computer Systems, Minneapolis, Minn., 1972.

[2] Harold Ireton and Edward Thwing, "The Minnesota Child Development Inventory in the Psychiatric-Developmental Evaluation of the Preschool-Age Child," Child Psychiatry and Human Development, Vol. 3(2), 1972, p. 102.

asked to respond returned the inventories. Twenty-nine of the answer sheets returned were excluded from the sample because they were improperly completed.

Since the original profile norms for the MCDI were based on a sample of 796 white children (395 males, 401 females), six months to six-and-a-half years of age, from upper-middle socio-economic English-speaking families in a Minneapolis suburban area, norms for this pilot study were developed to reflect the lower-middle socioeconomic level and Spanish-English, bilingual-bicultural background of the target group. The sex by age distribution of this new 364-children sample is:

Age in years	Interval used	Males	Females	Total
3	3.0 to 3.5	28	21	49
4	3.6 to 4.5	87	70	157
5	4.6 to 5.5	83	75	158
Total		198	166	364

Socioeconomic and family data for this sample as compared to that of the original sample indicate the following differences. In the standardization study, parents report at least a high school education or better; in this sample, parents report a maximum elementary-school education. Fathers in the present study (80%) are engaged in factory, service or labor occupations; whereas in the original study fathers (43%) are in professional or managerial occupations. Parents in the current sample indicate having a larger

number of children (mean 3.8 vs mean 2.8) than those in the original sample. Mothers for both samples are full-time homemakers. It should be noted, however, that mother-child interaction probably occurs with greater frequency within the traditional American family structure; peer and sibling interaction may be more characteristic of the Latin-American extended-family structure.

Analysis of Data

The data analysis for the present study was done in three stages. First, descriptive statistics were calculated. Second, a multivariate analysis of variance (MANOVA) was conducted which had age and sex as independent variables and the eight subscales as dependent variables. A discriminant analysis was done as part of the MANOVA in order to determine the extent to which each independent variable contributed maximally to differentiate between sex and age levels. The third stage included a profile comparison of age means between the original norms and the norms for the present sample. The age median was also used as an alternate measure of central tendency. In addition, a check on age level achievement on certain randomly selected items was done. This process included identifying and comparing, for each age level, the percentage of "Yes" responses for the selected items.

Results and Discussion

Where development on a factor is specified by theory, a measure of general development is valid only if it discriminates among children of different ages. Such discrimination is evidenced by an increase in mean scores with an increase in age and by limited variability within age groups, as contrasted to over all age groups. The results of the descriptive analysis presented in Table I indicate a developmental trend for both males and females over all scales, except in the gross motor scale for males. The reversal of this trend at age four and the rather constant high scores over ages in general may be attributed to the low age-discrimination index of this scale beyond age three, as observed by Ireton and Thwing (1972).

Insert Table I about here.

In the discussion of the validation of the scales, the Manual for the MCDI points out that the age-three plateau reflected by a number of scales may also be due to the fact that progress beyond this age-level consists mainly in the "refinement of previously established skills." Thus, by the time a child becomes three years old, for example, he is expected to improve in practical language skills (ie, improved articulation, more complex syntax) which are more difficult to judge.

The results of the multivariate analysis of variance are presented in Tables II through IV. The MANOVA was done with two factors, sex (two levels) and age (three levels). The data indicate there is no sex by age interaction effect on general development nor on development in any individual scale. Concurrent with the original study (Ireton and Thwing, 1972), the results indicate a significant sex difference ($p < .006$) and a significant age difference ($p < .001$) on all eight scales considered simultaneously.

Insert Tables II through IV about here.

The results regarding individual scales vary. For the age factor, only the gross motor scale shows no statistically significant age effect. The same conclusion was apparent from an informal analysis of the descriptive statistics. For the sex factor, there was a statistically significant difference in only one of the seven scales. Females tend to be slightly higher on the self help scale than males.

A discriminant analysis of the data indicated the following combinations of the eight scales yield maximal discrimination between sexes and among ages respectively. The standardized discriminant functions are as follows; "x" represents an individual scale:

$$V_{sexes} = .342_{x1} - .292_{x2} - .779_{x3} - .269_{x4} + .171_{x5} + .196_{x6} + .625_{x7} + .263_{x8}$$

$$V_{ages} = .294_{x1} - .336_{x2} + .175_{x3} - .125_{x4} + .604_{x5} - .229_{x6} + .535_{x7} - .034_{x8}$$

Since discrimination of development among ages is important information, calculation of a composite score using the V_{ages} might be useful. The weights for the individual scales will vary from sample to sample.

Profile Comparison Between Norms

The profiles presented in Figures 1 and 2 show the standing of present-sample males and females at different age levels in relation to the norms presented by Ireton & Thwing. Each profile includes three values on each scale: the original norm based on means (horizontal solid line), and the current sample norm based on means (short broken line) and on medians (longer broken line).

An examination of the male profiles for ages 3, 4 and 5 shows a dramatic change. At age 3 the norms for males in this study on the various scales are above the corresponding male norms in the original study, except for the personal-social scale. As age increases, however, the norms for males in the current sample tend to fall below those established by the standardization sample; this occurs in five out of eight scales at age 4 and in all eight scales at age 5. A tentative explanation for the apparent lag was

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Insert Figures 1 and 2 about here.

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discussed earlier; namely, the low age-discrimination power of some scales may be due to the difficulty in judging the refinement of skills that normally occurs beyond age three in many areas of development.

Another plausible explanation concerns the attribution of causality. That is, since the parents assessed the developmental status of their children, it cannot be determined from the present data whether the apparent differing levels of development between Latino and Anglo children should be inferred to represent actual differences in the children or actual differences in response tendencies of the parents. A more detailed study may be able to resolve this issue.

An examination of female profiles for ages 3, 4 and 5 (Figure 2) indicates generally that norms for all three age groups tend to be below those of the original sample. An exception is the situation comprehension scale, where the present-sample norm is consistently higher than the original norm for all three age levels. Thus, while pilot local norms for females across ages show consistent deviations from the original norms, the lag in the present-sample male norms tends to increase with age.

Item Analysis Check

A random sample of items was checked for developmental validity using the relative frequency of "Yes" responses across age levels. All the sampled items were judged valid, ie, each item endorsed "Yes" by "n" percent of parents at age "a" was endorsed by "m" ($m > n$) percent of parents at age "a + 1."

Conclusions and Recommendations

I. In terms of identifying the developmental characteristics of children included in this sample, the important findings of this study are:

A. The preschool children in the current sample are rated below those in the original norming sample in general development and in many of the individual scales. This is particularly true of both males and females at all age levels in the personal-social scale.

B. Concurrent with the original norming study is the conclusion that the age-discrimination power of some scales is restricted to certain age ranges. The interpretation of data from four scales beyond age three must be done with caution.

II. In reference to a comparison between original and local norms, the major findings are:

A. The observed differences between the norms based on this pilot study and the original study indicate a need for developing local norms to interpret data from populations similar to the one used in this study. This in fact is a direction given by Ireton and Thwing.

B. The differences between norms tend to vary systematically over ages in the case of males. The increasing degree of lag between local and original male norms as age increases is alarming and warrants further controlled investigation.

C. The pattern of difference between norms for females tends to be stable over age levels. Local norms are consistently below the original norms, except in the situation comprehension scale where the local norm is consistently higher at all age levels.

III. Regarding the use of the MCDI to evaluate children participating in early childhood bilingual education programs, the Inventory is recommended as a useful, versatile instrument. The results of this study and the experience of the researchers during data collection and analysis suggest the following considerations.

A. When using the Inventory for children of non-English speaking or bilingual backgrounds, parents must be offered the option of a valid translation.

B. Keeping the respondent in mind, the instrument is rather long (320 items) and covers a wide age-range (6 months to 6½ years). Both of these factors may tend to reduce the validity of the instrument. For example, when assessing the development of a four-year-old, it is quite probable that all the items intended for evaluation of one-year-olds, and perhaps a minimum of 5 or 10 percent of the items geared for two- and three-year-olds, may not be discriminating. The tendency for parents to assume an item response set due to a "fatigue" factor may also reduce the age-discrimination power of the scales.

A possible solution might be to reformat the instrument, rearranging the items to allow a flexilevel approach. To illustrate, for evaluation of a one-year-old, the informant is asked to respond to items 1 through 100; for a two-year-old, to items 50 through 175; and for a three-year-old, to items 111 through 250. Local norms can then be developed accordingly.

C. Finally, to provide a more objective picture of a child's developmental characteristics, the parent responses to the MCDI might also be compared to the classroom teacher's responses on the Inventory for the same children.

TABLE I

Developmental Characteristics of Different Age and Sex Groups
on the Eight Scales of the Minnesota Child Development Inventory
Descriptive Statistics

Sex	Age in Years	Number of Observations		General Development	Gross Motor	Fine Motor	Expressive Language	Conceptual Comprehension	Situational Comprehension	Self Help	Personal Social
Males	3	28	Mean	98.96	29.18	33.39	46.21	42.82	34.11	28.21	26.32
			S.D.	12.76	2.62	4.61	7.93	10.00	5.11	4.06	3.51
	4	[illegible]	Mean	104.31	28.98	35.68	48.44	45.59	35.41	28.99	27.46
			S.D.	15.16	2.95	4.67	4.76	8.35	4.83	4.06	3.55
	5	83	Mean	110.65	29.35	36.83	49.34	51.16	37.43	31.57	28.35
			S.D.	17.02	3.71	5.46	5.91	8.28	4.82	2.85	3.48
Females	3	21	Mean	98.19	27.57	31.33	46.29	43.09	34.71	28.67	26.48
			S.D.	14.65	4.97	6.21	8.54	12.07	6.50	4.86	4.11
	4	70	Mean	107.77	29.09	35.03	48.04	47.21	36.91	30.76	27.99
			S.D.	12.35	3.01	6.62	6.23	9.51	5.10	3.56	4.38
	5	75	Mean	112.27	29.23	35.76	49.19	51.83	36.75	32.08	28.79
			S.D.	10.24	3.68	5.51	5.39	7.56	6.05	2.86	3.42

TABLE II
Sex x Age Interaction Effect on Development

Multivariate Tests of Significance Using Wilks Lambda Criterion

Test of Roots	F	DFHYP	DFERR	P less than
1 through 2	0.923	16.000	702.000	0.541
2 through 2	0.808	7.000	351.500	0.580

Univariate F Tests

Variable	F (2,358)	Mean SQ	P less than
GD	0.457	90.091	0.633
GM	1.182	13.826	0.307
FM	0.300	9.196	0.740
EL	0.033	1.189	0.967
CC	0.166	12.920	0.846
SC	1.688	46.993	0.186
SH	1.423	17.823	0.242
PS	0.045	0.631	0.955

TABLE III
Sex Differences on Development

Multivariate Tests of Significance Using Wilks Lambda Criterion

Test of Roots	F	DFHYP	DFERR	P less than
1 through 1	2.690	8.000	351.000	0.006

Univariate F Tests

Variable	F (1,358)	Mean SQ	P less than
GD	2.593	510.712	0.108
GM	0.320	3.749	0.571
FM	2.648	80.949	0.104
EL	0.066	2.388	0.796
CC	1.813	140.364	0.178
SC	0.761	21.194	0.383
SH	9.219	115.457	0.002
PS	1.541	21.232	0.215

TABLE IV
Age Effect on Development

Multivariate Tests of Significance Using Wilks Lambda Criterion

Test of Roots	F	DFHYP	DFERR	P less than
1 through 2	4.591	16.000	702.000	0.001
2 through 2	1.135	7.000	351.500	0.340

Univariate F Tests

Variable	F (2,358)	Mean SQ	P less than
GD	16.686	3286.174	0.001
GM	1.076	12.587	0.341
FM	9.110	278.443	0.001
EL	4.908	175.507	0.007
CC	23.014	1780.855	0.001
SC	5.186	144.323	0.006
SH	21.981	275.262	0.001
PS	6.640	91.465	0.001

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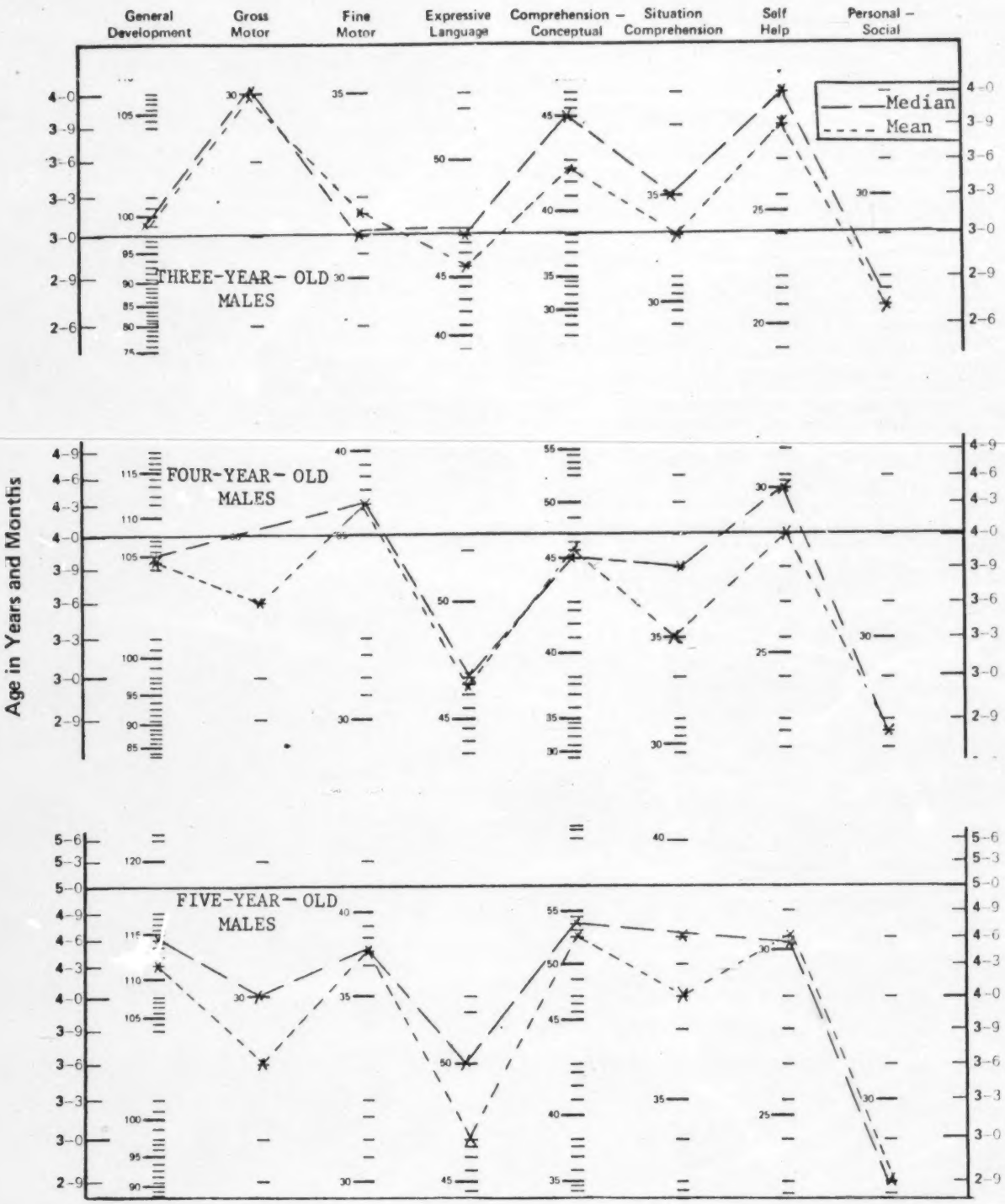

FIGURE 1: Profiles of 3- 4- and 5-year-old males on MCDI subscales.

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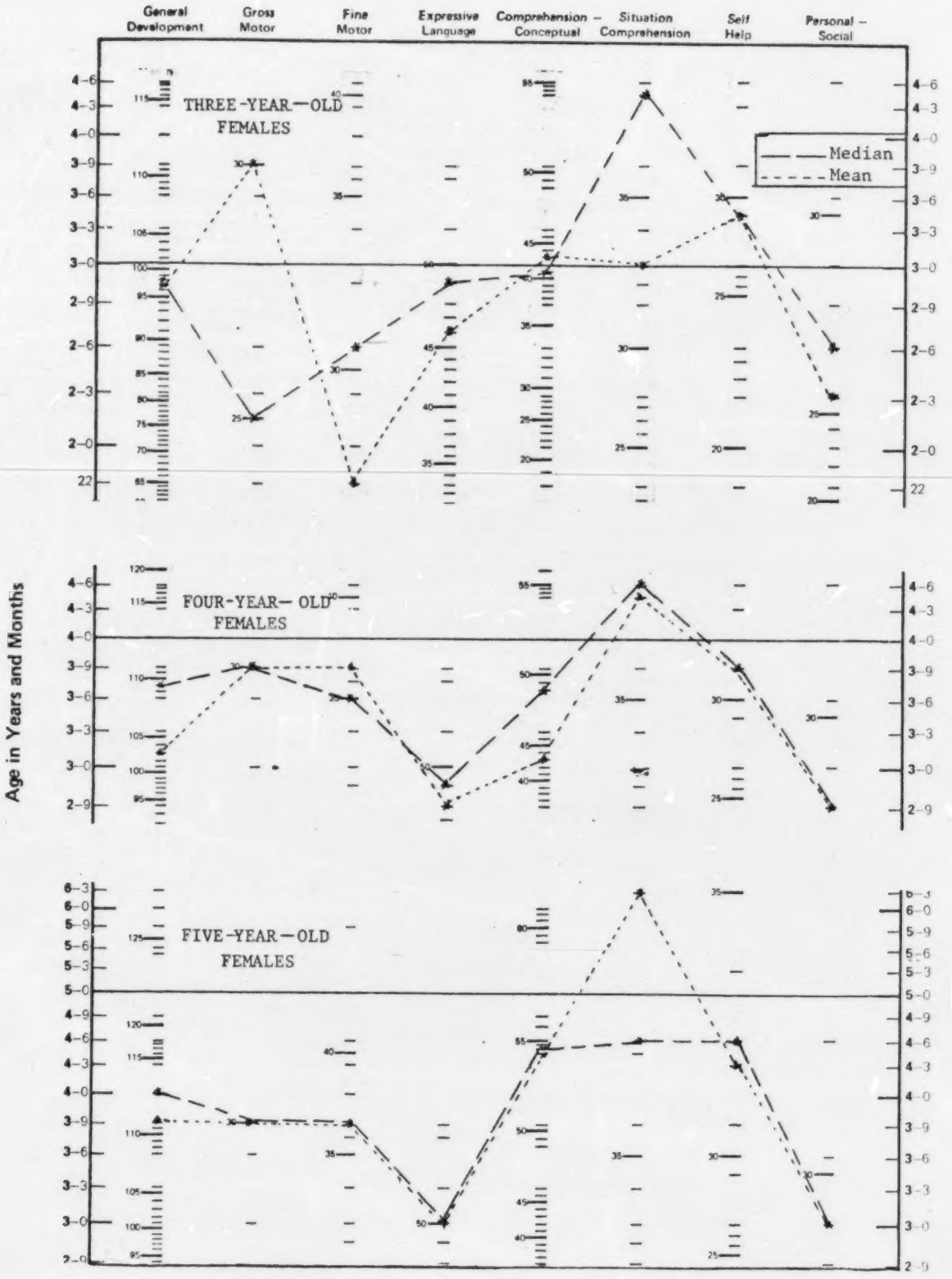

FIGURE 2: Profiles of 3- 4- and 5-year-old females on MCDI subscales.